Sixth Integrated Communications, Navigation and Surveillance (ICNS) Conference and Workshop 2006

Conference Report

Prepared by:

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2006 ICNS Conference Chair:

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1.0 INTRODUCTION

The NASA Glenn Research Center organized and hosted the Sixth Integrated Communications, Navigation, and Surveillance (ICNS) Technologies Conference and Workshop, which took place May 1-3, 2006 at the Hyatt Regency Baltimore Hotel in Baltimore, Maryland.

This sixth conference of the annual series continued the successes of previous conferences: the first ICNS Conference (May 1-3, 2001 in Cleveland, Ohio); second ICNS Conference (April 29-May 2, 2002 in Vienna, Virginia); third ICNS Conference (May 19-22, 2003 in Annapolis, Maryland); fourth ICNS Conference (April 26-30, 2004 in Fairfax, Virginia); and fifth ICNS Conference (May 2-5, 2005 in Fairfax, Virginia).

The purpose of the Sixth ICNS Conference was to addresses research and development of integrated CNS technologies for advanced aeronautical digital information systems and applications supporting the future national and global air transportation systems. It focused on understanding CNS programs, plans, research and technology, and other relevant issues for both near/mid-term (by 2015) and far-term (beyond 2015) time frames.

Key topical areas included:

- Relation between Net-Centric Operations (NCO) and System Wide Information Management, including FAA status/plans of implementing IP-based information networks and transitioning of base Department of Defense networking and avionics R&D into civilian aviation
- Technology R&D impacts upon current policy and how R&D can influence future policy
- Impacts of UAVs, regional/microjets, and other non-traditional commercial transport upon current CNS infrastructure and services
- International perspective in aviation and air traffic management
- Increased utilization of non-major-hub airports, including the R&D needed to evaluate and implement “virtual tower” concepts to increase efficiencies and reduce costs.
- Required total system performance including CNS

Presentations were also invited for the technical sessions along the key topical areas including:

- Integrated CNS Systems and Architectures
- Airspace Communications Networks
- Datalink Communications Systems
- Independent Surveillance Systems
- Navigation Systems
- CNS Research and Technology Development
- System Demonstrations, Evaluations and Experiments
- Safety and Security Initiatives Impacting CNS

- Avionics for System-Level Enhancements
- Weather Products for Airspace Management
- System Wide Information Management

The conference attracted 185 attendees from government, industry and academia to address these purposes through plenary panel sessions, technical presentations, breakout workshop sessions, and individual and group discussions during the workshop and after-hours events, and included 12 international attendees. An Executive Committee consisting of representatives of key segments of the aviation community concerned with CNS issues met on the day following the conference to consider the primary outcomes of the conference.

This report presents an overview of the conference, workshop breakout session results, and the findings of the Executive Committee.

2.0 ORGANIZATION OF THE SIXTH INTEGRATED CNS CONFERENCE AND WORKSHOP

The Sixth ICNS Conference and Workshop consisted of four primary elements: Plenary Sessions consisting of presentations on major topics and trends in aviation; Technical presentations covering a variety of topics relating to CNS requirements and research needs; three workshop breakout sessions to generate issues, ideas and recommendations for future CNS research and development; and an Executive Committee working meeting to condense the ICNS Conference and Workshop results into a concise summary including key issues and recommendations.

At the opening of the Conference on May 1, 2006, welcoming remarks by the Conference Chair Michael Zernic of the NASA Glenn Research Center were followed by a Plenary Session focused on the Next Generation Air Transportation System – Building Upon the Foundation, chaired by Mr. Karl Grundmann, JPDO Communications Director, and included presentations by the panel members Mr. Robert Pearce, Acting JPDO Director, Mr. John Scardina, JPDO Portfolio Management Division; Mr. Rick Castaldo, Federal Aviation Administration (FAA); and Mr. Mike Hawthorne, FAA.

The second Plenary Session on the Eurocontrol/FAA Future Communications Study (FCS) took place on May 2, 2006 chaired by Mr. James Eck of the FAA and Mr. Mel Rees of Eurocontrol and included presentations by panel members Mr. Brent Phillips, FAA and Mr. Jacky Pouzet, Eurocontrol; Mr. Gregg Anderson, FAA; Mr. Glen Dyer of ITT Industries and Mr. Phil Platt of QinetiQ; and Mr. Dean Lamiano of The MITRE Corporation. Questions from the audience were fielded by the panel to conclude the session. The FCS theme continued with technical sessions for the remainder of the day.

The third Plenary Session on Performance-Based System Implementation Challenges took place on the morning of May 3, 2006, chaired by Mr. David Hamrick of The MITRE Corporation and included presentations by panel members Mr. Jeff Williams, FAA; Mr. Rick Castaldo, FAA, and Mr. Ralf Mayer, The MITRE Corporation. The panel then fielded questions from the audience to conclude the session.

Eleven technical presentation sessions filled the program from May 1-3, 2006:

Session A1:	Communication Technology Chair: Mr. Art Feinberg, Intelligent Automation Inc.
Session A2:	Navigation and Surveillance Chair: Mr. Chris Daskalakis, DOT Volpe National Transportation Systems Center
Session A3:	Netcentric Operations and SWIM Chair: Mr. Rafael Apaza, Federal Aviation Administration
Session B1:	Future Communications Study Chairs: Mr. James Budinger, NASA Glenn Research Center, and Mr. Jacky Pouzet, Eurocontrol
Session B2:	Airspace Safety and Security Chair: Thomas Tanger, Ohio Aerospace Institute
Session B3:	Surface Systems and Architectures Chair: Mr. Len Carlson, Technology Services Corporation
Session C1:	Aeronautical Information Services (AIS) Communications Chair: Mr. James Griner, NASA Glenn Research Center
Session C2:	Future Global Policy Chair: Mr. David Buchanan, NASA Glenn Research Center
Session C3:	Integrated CNS Systems and Architectures Chair: Mr. Kenneth Arkind, Raytheon
Session C4:	CNS/ATM Simulation and Evaluation Chair: Mr. Chris Wargo, Computer Networks & Software, Inc.

Ms. Denise Ponchak of the NASA Glenn Research Center served as the technical program chair. The list of presenters and titles of their presentations is given in Appendix A of this report. The presentations are posted on the Integrated CNS Workshop website at http://spacecom.grc.nasa.gov/icnsconf/.

At the conclusion of the presentations, three workshop breakout sessions were held during the afternoon of May 3, with participation of the workshop attendees according to their interests. Mr. Robert Kerczewski of the NASA Glenn Research Center served as the overall Workshop Chair. The workshop breakout sessions were:

1. The NGATS-CNS National Testbed
   Co-Chairs: Mr. Rafael Apaza, FAA; Mr. Mike Gerry, Sensis Corporation
2. The Future of Required Total System Performance (RTSP)
   Chairs: Mr. Thomas Kraft, FAA; Mr. Robert Kerczewski, NASA Glenn Research Center
3. Network-Enabled Information Access for NGATS
   Chairs: Mr. Chris Wargo, CNS Inc; Mr. Jim Dieudonne, Mitre Corporation

The breakout session results are summarized below in Section 3.2.

The Executive Committee met during the morning of May 4, 2006, to review the presentations from the technical and panel sessions and the outputs of the three breakout sessions in considering the Executive Committee comments and recommendations to be included in the Sixth Integrated CNS Conference and Workshop Final Report. Mr. Kerczewski, Mr. Phillips, Mr. Gonda, Mr. Homans, and Ms. Ponchak were present during the meeting. The results of the Executive Committee meeting were collected and compiled into the Final Report by the

Executive Committee Chairman, Robert Kerczewski of NASA. Other members of the committee reviewed the final report prior to its completion and their comments are included herein. The following section presents the Executive Committee's comments and recommendations.

3.0 THE FINAL REPORT OF THE EXECUTIVE COMMITTEE OF THE SIXTH INTEGRATED CNS CONFERENCE AND WORKSHOP

The Integrated CNS Conference and Workshop Executive Committee examined the plenary and technical presentations, and in particular the results of the three Workshop Breakout Sessions to determine the issues and recommendations to be contained in the Conference Final Report. The Workshop Breakout Sessions were chosen to reflect some of the key issues in aviation in regards to aeronautical CNS.

In producing this report, the Executive Committee reviewed the Breakout Session outputs individually, and also observed common themes and issues. Results collected from the Executive Committee deliberations are therefore grouped into two areas: Major Conference Summary and Recommendations, and Key Breakout Session Results.

3.1 Major Conference Summary and Recommendations

Themes that emerged during the Executive Committee discussions are organized into two major areas – results of the plenary sessions and general conference and aviation industry trends.

3.1.1 – Overall Conference Review and Comments

The Executive Committee discussed trends that emerged at the Conference, as well as the organization and technical content of the Conference. The following comments summarize the trends observed during the Conference, and the effectiveness of the conference organization and content.

The Executive Committee believes that the Integrated CNS Conference is unique in presenting concepts being developed and work being done to bring new concepts to life. For example, many presentations focused on how the NAS architecture is progressing in line with the NGATS vision, as well as supporting technologies, implementation activities, testing, evaluation and analyses. The ICNS Conference program is very complementary to the Digital Avionics Systems Conference (DASC), the USA/Europe Air Traffic Management (ATM) R&D Seminar, and the AIAA Aviation Technology, Integration and operations (ATIO) Conference. Thus, ICNS makes a vital contribution to the overall ATM/CNS agenda. The Executive Committee also pondered the possibility of co-locating ICNS with another complementary conference in order to take advantage of organizational efficiencies and gaining a wider audience, and recommends that this be investigated by the conference planners.

The plenary sessions continue to be an important draw for conference attendees. The Next Generation Air Traffic System (NGATS) and the Future Communications Study (FCS) are perhaps the two most important CNS activities taking place at the current time, and so are of great interest to the conference attendees and logical choices for plenary sessions. In addition, as both activities will continue through next year, they would be good potential choices for plenary sessions in the 2007 ICNS Conference. The Executive Committee also noted that

having the FCS technical sessions immediately following the FCS Plenary Session worked very well, and this plan should continue to be applied to future conferences whenever possible.

The conference should continue to emphasize the development of the NAS architecture in line with the NGATS vision and the CNS R&D activities that are supporting this development. Possible themes that should be considered for the next conference plenary sessions include the new FAA initiatives in System Wide Information Management (SWIM) and Automatic Dependent Surveillance – Broadcast (ADS-B).

The absence of a major keynote speaker at the 2006 conference was noted. The Executive Committee members believe that having such a speaker can also draw attendance, however it is recognized that scheduling such a speaker is quite difficult.

3.1.2 ICNS Conference 2006 Plenary Sessions

Three plenary sessions were presented at the conference. The first, titled Next Generation Air Transportation System – Building Upon the Foundation, focused on NGATS progress and plans, vision and roadmap, and the role of SWIM and ADS-B in the NGATS vision. The second presented progress and status on the Eurocontrol/FAA Future Communications Study, presenting an overview of the study, the Communications Operating Concept and Requirements (COCR) development, the technology evaluation activity, and the Communications Roadmap. The third plenary, Performance Based System Implementation Challenges, discussed Required Navigation Performance (RNP) and Area Navigation (RNAV) implementation and benefits, and ADS-B implementation roadmap.

All three plenary sessions were well attended and included active dialog between the panels and the audience during the question and answer sessions. Each one presented valuable discussions and insights in critical areas relevant to future CNS needs and approaches to realizing those needs. As noted above, the Executive Committee recommends that the three plenary session format be repeated at the next conference. The sections below provide additional elaboration of the plenary session's results.

In particular, the Executive Committee recommends that as the Future Communications Study is scheduled to be completed just prior to the 2007 ICSN Conference, the FCS results can be presented. A JPDO-NGATS plenary session is also recommended, however with an increased emphasis on the communications, navigation and surveillance issues of particular interest to the ICNS Conference audience.

3.1.3 ICNS Conference 2006 Technical Sessions

The Technical Sessions included 68 technical papers and/or presentations (not including plenary session presentations). The Executive Committee observed the continued quality of the technical sessions, and noted that over the six years of the conference technical presentations that are at the margin, or outside of, the conference purpose have self-filtered as such presenters have located better venues for their work.

The ICNS Conference has maintained the policy of not requiring a written technical paper for conference technical sessions presentations, with the caveat that the presenter's presentation materials can be included in the conference proceedings in place of a technical paper. This has enabled some presenters, who can provide information of great interest to the conference

attendees but are not able to prepare written technical papers, to participate. The Executive Committee recommends that this practice continue, as it enables the conference goal of information exchange within the conference's unique position in CNS/AMT development.

The conference technical sessions presented an excellent range of CNS R&D topics. The Executive Committee recommends some topics that should be considered for the 2007 Conference technical sessions around which technical sessions should be organized, included: tracking NGATS-related R&D and impact on NGATS development over the next 10-15 years; certification, perhaps paired with safety and security; mandates, incentives and regulatory policy; and user benefits for ADS-B.

3.2 Key Breakout Session Results

The key results from each of the three Workshop Breakout Sessions were prepared under the direction of the co-chairpersons of each session. The Executive Committee agreed with the comments and recommendations of the session, with a few additions, as presented in summary form below. The Executive Committee also recommends the additional description of the purpose and goals of the workshop sessions be provided in the conference agenda, possible in the form of an abstract.

3.2.1 The NGATS-CNS National Testbed

After an overview of the NGATS-CNS National Testbed was given, the workshop session focused on applications of the testbed, including applications of the airport surface wireless network, NEO/SWIM enabled applications, 4D-trajectroy experiments, and potential linkage with other testbeds. The following is a summary of key points.

Application of Wireless Network

- General applications
  - Wireless comm loop on airport – increased accessibility and decreased cost compared to traditional wired
  - Mobility for users
  - Wake vortex sensors off runways/airports (brought into SWIM network)
  - Airport perimeter security sensors
- Segregation and prioritization of data
- Other sensors
  - Icing sensors
  - RVR
  - Runway occupancy sensors
- Network extension to the aircraft
  - Technical & Operational are open questions…not in the plan today but should be addressed in the future
  - What applications?
    - Updating flight plans, text messaging, maintenance – technical manuals, video conference
    - "Gatelink" for regional airlines (download aircraft data)
- Integrate with Emergency Response teams
  - Aircraft info (cargo on board - hazmat)
  - Location info (from ASDE-X)

NEO/SWIM-enabled Applications

- Possible Network-Enabled applications
  - Virtual Tower (Remote Air Traffic Services)
  - Digital ATIS over UAT to cockpit as text message
    - Consolidating ATIS info report and broadcasting it
  - Traffic flow management
  - Regional situational awareness
  - Collaborative decision making based upon roles/responsibilities
  - Manage a region rather an airport
  - Combining data in ways that we haven't even thought of yet

4D Trajectory Experiments

- Open questions on the 4D experiment
  - Throughput requirement of data link to support 4D exchange operationally
  - Processing capability of 4D "computer" on ground – i.e. what is the capability required of the automation functions?
- Given the complexities of 4D experiments in the air, should consider 4D on surface
- FANS ADS equipped aircraft may be available in and around Cleveland for use
- Demonstration of cooperative processing between aircraft

Possible Testbed Linkage

- Given the proliferation of Test Beds, the following comments were made:
  - Mitre "Simnet" – interconnects different testing facilities
  - Military has been linking different simulation sites
  - Will Sensis sensor data be available for others to experiment with?
  - Geographically disbursed test beds can exercise the network connectivity

3.2.2 The Future of Required Total System Performance (RTSP)

After an overview provided by Tom Kraft of the FAA, the participants discussed a wide range of topics relevant to the future of RTSP:

Is RTSP only RCP, RNP, RSP? In general, yes. But within ICAO, unresolved.
Theoretical vs. practical dictates initial focus on C, N, S
Linking separation assurance to operational concept - Ex: where do you put conflict detection? An alternative is to consider levels of uncertainty

Is there a risk of technology proliferation resulting from this definition of requirements?
Technologies may still be specified, especially by states

How to determine economic benefits – dependence on higher level operations

Performance criteria vs. technology. Is the technology part of RTSP? How do you show technology meets the RTSP?
Coverage issues (e.g. RNP based on ground-based navaids vs. ocean)

Why specify RCP, RNP, RSP rather than just RTSP?
RTSP could include things beyond C, N, S
Performance based operations – to include RTSP plus the other stuff
Example: RNP does not include RVSM

Example: closely spaced parallel runways: C, N, S and also crew training (RNP requires crew approval)
Example: RNP can be specified, but can the platform also respond

The current debate in RTSP centers around how to proceed from the current state to the comprehensive RTSP definition that includes all these other issues. Current RCP deliberations demonstrate the difficulties

What is the challenge to certification created by this paradigm?
Allocation of parameters is one challenge
Some parameters cannot be allocated
How will ANSPs ultimately implement RTSP?
Interoperability and/or interfaces will need to be specified as well.
Would an ANSP be required to support multiple technologies selected by the users?
This might depend on regional approaches to RTSP
How does RTSP define the backup systems required?
Backup requirement comes from availability requirement and architectural approach to meeting the availability
What happens to RTSP in failure situations?
Contingency, procedures will be part of it
Rulemaking can be performance based; advisory or guidance materials can be related to particular technologies (like ICAO's approach)

CONCLUSIONS

RTSP is going to be of value and should be explored

RTSP consisting of RCP, RNP, RSP is necessary but not sufficient, but is a good starting point for beginning practical application.
The practical application of RTSP would require a clear and precise definition of the operational context (performance based operations)
RTSP is a complement to technology exploitation
A "roadmap" for how RSTP development and definition should proceed from current RC/N/SP roadmaps to a "comprehensive" RTSP

3.2.3 Network Enabled Information Access for NGATS

The workshop participants reviewed talking points and issues that were gathered from the following sources: Col. David Rhodes, Chair JPDO SSA IPT; Dr. Tim Rudolph, ESC; Dr. Jerry Friedman, JPDO Chief Engineer; Tom Nyman, MITRE; and Kevin Harnett, Volpe. The participants then addressed the workshop objective and developed key issues as follows.

Workshop Objective:

– To achieve the vision of NGATS through a Net-centric architecture – what are the key research tasks required in CNS?

Key Issues Developed by Workshop Participants

- List the workshop developed research tasks:

- How will the DoD air-ground link technology be translated to the civil aviation world?
    - Is this the issue, the JPDO should look into?
- What management capabilities -- for communication, data, and information services -- are needed to support networked enabled operations?
- What are the most important information services that must be implemented first for an FAA NEO capability?
- What are we going to do to describe the net-centric security architecture and services?
    - It makes a difference choosing aircraft-centric security vs. net-centric security.
    - Emphasis on cyber security.
    - Requires certification criteria and policies.
    - What information security capabilities are appropriate to support interoperability with other Federal agencies?
    - Is the net-centric concept for JPDO going to force a multi-level security in the NGATS network?
    - How should the services be classified (for security, for safety)?

- How do you make the air-ground communications implementation (equipage, infrastructure, ownership) cost-effective?
- Should there be “GIG” for all aviation agencies/stake-holders?
- Pursue MCNA with FCS requirements?
- Development of large scale modeling and simulation tools.

3.3 The Future of the ICNS Conference

The ICNS Conference, per agreement between NASA Glenn Research Center and the Digital Avionics Technical Committee (DATC) of the American Institute of Aeronautics and Astronautics (AIAA), will be organized in the future by the DATC and Aerospace Electronic Systems Society (AESS) of the Institute of Electrical and Electronics Engineers (IEEE). There are two primary reasons for this change. First is the current budget situation for NASA, which presents significant uncertainty in the funding of support and logistics activities needed to maintain the high level of quality of the previous ICNS conferences. The second is a recent Government Accounting Office (GAO) ruling, the most important aspect of which essentially prevents government agencies from sponsoring events which require a registration fee. Without a registration fee, the costs of continuing the ICNS conference on the same level as that to which we have become accustomed are unbearable given the current available budget.

Hence, the DATC has consented to provide the necessary organizational and financial support of future ICNS conferences. NASA Glenn Research Center will continue to provide technical planning support to DATC.

The future of the ICNS conference was a subject of the Executive Committee Meeting of 4 May 2006. To summarize these discussions, the Executive Committee has recommended that the conference continue as it has during the past several years. This includes the general format of plenary, technical and workshop sessions; the practice of not requiring formal technical papers for presenters; the logistics of on-site breakfasts and lunches, evening dinner and one evening off-site activity; re-establish the evening exhibitor cocktail reception (which was not held this

year due to government rules); and maintaining the conference location in the general Washington DC area.

3.4 Summary of Recommendations

The Executive Committee offers the following recommendations for future ICNS Conferences, based on observations of the 2006 Conference.

- The ICNS Conference seems to have achieved a good balance of location, theme, and format during the past two or three years. The DATC, which will take over organization of the ICNS Conference in the future, should endeavor to maintain the conference format and logistics that are now established. Continuity of the conference is extremely important. The DATC should also strive to minimize any increase in the conference registration fee.

- Co-location of the ICNS Conference and another complementary conference should be considered.

- Plenary sessions for the 2007 ICNS Conference should include the Future Communications Study and the NGATS Progress focused on communications, navigation and surveillance.

- Coverage of emerging FAA initiatives on SWIM and ADS-B should be increased at the 2007 ICNS Conferences, possibly within a plenary session.

- The Conference should try to have a major keynote speaker to open the conference. As well, scheduled a speaker for the evening dinner is recommended.

Other general recommendations resulting from the Sixth ICNS Conference include the following:

The conference should continue to emphasize the development of the NAS architecture in line with the NGATS vision and the CNS R&D activities that are supporting this development.

Increasing the number of exhibitors at the conference would be good. Co-locating with another complementary conference would help this process.

Although Baltimore presented an excellent venue for the conference, a location closer to Washington DC may help attract more Washington-based participants.

Separate chairs should be established for sponsors and exhibits to increase activities in these two areas.

It should be considered to reduce the number of parallel sessions during the last afternoon of the conference to reflect the usual reduced attendance at the conference draws to a close, as occurs every year at ICNS and in fact at all conferences.

Finally, conclusions and recommendations reached by the three workshop sessions are endorsed by the Executive Committee as presented in Section 3.2.

4.0 CONCLUSION

The Sixth ICNS Conference and Workshop continued a series of successful conferences and workshop dating to the first conference, held in May, 2001. Each conference has succeeded in terms of high attendance, number of presentations, and overall value to the aviation community and to NASA as conference host. The 185 participants and over 80 presentations at the 6th ICNS Conference are a testament to the growing recognition of the importance of developing an advanced, high performance and high capacity integrated communications, navigation and surveillance infrastructure to carry the national and global airspace systems into the implementation of the Next Generation Air Transportation System. The aviation community has been an enthusiastic participant in the definition and development of the future ICNS infrastructure through the ICNS Conferences, and has contributed substantially to the development of NASA CNS R&D programs through this process.

A summary of conclusions and recommendations resulting from the 6th ICNS Conference has been compiled based on the ICNS Conference Executive Committee deliberations on the morning of May 4, 2006, and is presented in this report. The Committee based its work on the review of the Conference plenary session and technical session contributions of the conference participants, as well as the breakout workshop session results. The workshop breakout sessions developed summaries of their deliberations, which are contained in full in section 3.2 of this report. As a result of time limitations of the Committee meeting, the conclusions and recommendations represent the highlights and key issues gleaned from the conference and workshop results. These conclusions and recommendations are presented in sections 3.1 and 3.4.

APPENDIX A
The Technical Sessions of the 6th Integrated Communications, Navigation and Surveillance Technologies Conference

Monday, May 1, 2006	
Session A1 – Communication Technology **Session Chair: Art Feinberg, Intelligent Automation, Inc**.	
Airborne Networking Multi-Aircraft Network Capability Demonstration	Ralph Yost, Federal Aviation Administration, William J Hughes Technical Center
Software Defined Radio Qualification Approach	Michael Kocin, ViaSat, Inc.
Application of Link 16 Technology to Future Air Traffic Control	Michael Kocin, ViaSat, Inc.
Technical and Operational Aspects of Migration Concepts of a broadband VHF Communication System (B-VHF)	Bernhard Haindl, Miodrag Sajatovic, Johannes Prinz, Frequentis; Michael Schnell, DLR and Carl-Herbert Rokitansky, UNISBG (presented by Mr. Rihacek)
Compatibility Analysis of Airport Wireless Local Area Networks and Satellite Feeder Links in the 5091-5150 MHz Band	Izabela Gheorghisor, Yan-Shek Hoh, and Frank Box, The MITRE Corporation
Laser Communications to Beam Optical Band to Distant Points	Belal Hamzeh and Mohsen Kavehrad, The Pennsylvania State University
Wireless Spacecraft Bus - A Radio Frequency Based Data Communication Architecture	Min Song, Sachin Shetty, Robert Ash and Kenneth Bone, Old Dominion University
Investigation of Operator Benefits from Reducing Horizontal Separations in North Atlantic Organized Track System	Almira Williams, CSSI, Inc.

Monday, May 1, 2006	
Session A2 – Navigation and Surveillance Session Chair: Chris Daskalakis, DOT Volpe National Transportation Systems Center	
Development of a Portable ADS-B Avionics Transmissions Evaluation Tool	Randy Sleight, The John Hopkins University Applied Physics Laboratory
Enhanced ADS-B	Edward Valovage and Kenneth Samuelson, Sensis Corporation
System Wide ADS-B Back Up and Validation	Alex Smith, Rick Cassell, T. Breen, R. Hulstrom and Carl Evers, Rannoch Corporation
Sea Trial / LTE for ADS – B STIMS 21-22	Dave McNamara, DCS Corporation (presented by Frank Bushman)
GPS/Galileo Performance Assessment for Aircraft Navigation and Approach	Helmut Blomenhofer, Thales ATM GmbH
"Airspace" Surveillance Transformation, Stovepipe to Service Oriented Architecture (SOA)	Christopher Smith and Charles Brown, Sensis Corporation
Risk Sharing and Risk Mitigation in Global Navigation Satellite System Market **(paper only)**	Mariagrazia Spada, University of Roma "La Sapienza"
Session A3 – Netcentric Operations and SWIM Session Chair: Rafael Apaza, Federal Aviation Administration	
Transforming the NAS Through System Wide Information Management and Network Enabled Operations	Chip Meserole, Boeing Company
Data Access and Distribution	Paul Comitz and Avinash Pinto, Boeing Company
Enhanced Situational Awareness via SWIM-Based Applications	Sid Rudolph and Jon Dehn, Lockheed Martin Transportation & Security Solutions
Design, Architecture, the National Airspace System, System Wide Information Management, Network-Centric Operations, and Service-Oriented Architecture	Michael McGrady, Topia Technology
Aircraft Mobility Within an Internet Protocol-Based National Airspace System	Brian Haberman, The John Hopkins University Applied Physics Laboratory
Service Oriented Communication Architectures in Safety Critical Environments	Johannes Prinz , Wolfgang Kampichler, and Bernhard Haindl, Frequentis GmbH
SWIM-SUIT: SWIM Supported by Innovative Technologies	Massimiliano DeAngelis and S. Porfiri, Selex-Sistemi Integrati

Tuesday, May 2, 2006	
Session B1 – Future Communications Study **Session Chairs: James Budinger, NASA Glenn Research Center and Jacky Pouzet, Eurocontrol**	
Overview of Current Eurocontrol Communications Activities	Jacky Pouzet, Eurocontrol
Spectrum Issues and WRC 07 Preparation	Michael Biggs, Federal Aviation Administration
FCS Evaluation Criteria for Technology Assessment	Tricia Gilbert, ITT Industries
FCS Technology Evaluation Process and Interim Results	Glen Dyer, ITT Industries
Development of Technology Shortlist for Future Investigations	Jacky Pouzet, Eurocontrol
Flexible Airborne Architecture	Jacky Pouzet, Eurocontrol and Phil Platt, QinetiQ
A Method for Estimating Air/Ground Data Capacity Requirements	Brian Hung, The MITRE Corporation
L-Band Channel Modeling	Jason Berger, ITT Industries
L-Band Digital Link for Air Traffic Services Data Communications	Warren Wilson, The MITRE Corporation

Tuesday, May 2, 2006	
Session B2 – Airspace Safety and Security **Session Chair: Thomas Tanger, Ohio Aerospace Institute**	
Enhancing Airspace Security in the Washington ADIZ	Scott Landriau, Patrick Markiewicz and John Zuna, Lockheed Martin Transportation & Security Solutions
Cyber Security Research Plans for a Secure Aircraft Data Network (SADN)	Kevin Harnett and Vince Rakauskas, Volpe National Transportation Systems Center
Network-Enabled Operations (NEO) Security Demonstration – Spiral 0	Michael Lewis and Gene Hayman, Boeing Phantom Works
Air-to-Air Avionics Integration	Michael Harrison, Aviation Management Associates, Inc.
Weather Integration on the Flight Deck – A Concept of Use Based on Operational Need	James Tauss, Aviation Management Associates, Inc.
Operational Evaluation of FAROS Final Approach Runway Occupancy Signal	Jaime Figueroa, Federal Aviation Administration; Noel Schmidt and Kirk Swanson, Architecture Technology Corporation
Simple Methodology for the Stochastic Independent Event Calculation of Air Traffic Conflicts	Seamus McGovern and Stephen Creaghan, Volpe National Transportation Systems Center
Tandem Optical Sensors to Assist in Runway Incursion Prevention	Seamus McGovern and Stephen Creaghan, Volpe National Transportation Systems Center

Tuesday, May 2, 2006	
Session B3 – Surface Systems and Architectures **Session Chair: Len Carlson, Technology Services Corporation**	
Airport Surface Network Architecture Definition	Thanh Nguyen, Analex Corporation; Wesley Eddy, Verizon Federal Network Systems; Steven Bretmersky, Cleveland State University; Fran Lawas-Greodek and Brenda Ellis, NASA Glenn Research Center
An Experimental Airport Surface Wireless Network	Steven DeHart and Phillip Neumiller, Sensis Corporation
Augmented and Virtual Reality Research for Tower Control at Airports	Marc Bourgois, EUROCONTROL Experimental Center
The Remote Airport Traffic Services Concept: Opportunities and Requirements	Chris Brinton and Stephen Atkins, Mosaic ATM
Virtual Mission Operations Center for Virtual Towers	William Ivancic and Phil Paulsen, NASA Glenn Research Center
The Future of Terminal Airspace: An Airportal for 2025	Mary Ellen Miller, Raytheon Company
Automated Arrival Traffic Flow Management Using 4D Trajectories	Dave Schleicher and Doug Sweet, Sensis Corporation
Research on Advanced Displays for Self-Separation and Sequencing at Non-Towered Airports	Keith Alter, Nav3D Corporation; Wallace Kelly, Blue Rock Research; Paul Snow, Mind's Eye Visualization and Louis Williams, RTI International
Wireless Channel Characterization: Modeling the 5 GHz Microwave Landing System Extension Band for Future Airport Surface Communications	David Matolak, I. Sen, W. Xiong, Ohio University; Rafael Apaza, Federal Aviation Administration and Lawrence Foore, NASA Glenn Research Center
An IEEE 802.16/802.11 Hybrid TAN Architecture for the Next-Generation NAS	Jack Burbank and William Kasch, The John Hopkins University Applied Physics Laboratory

Wednesday, May 3, 2006	
Session C1 – Aeronautical Information Services (AIS) Communication Session Chair: James Griner, NASA Glenn Research Center	
Flight Test Results of VDL-3, UAT, and 1090ES Datalinks for Weather Information Communication	James Griner, NASA Glenn Research Center
Transformational Aircraft Communication Using a Broadband Mesh Network	William McNary, AeroSat
Session C2 – Future Global Policy Session Chair: David Buchanan, NASA Glenn Research Center	
Shift the Current Air Traffic Management Paradigm: From Means to Objectives Management	Laurent Guichard and Sandrine Guibert, EUROCONTROL Experimental Center; Didier Dohy and Jean-Yves Grau, NeoSYS
Architecture & Requirements Development for the Next Generation Air Transportation System	Robert Avjian, Steven Rosen and Paul Mettus Lockheed Martin Transportation & Security Solutions
CNS/ATM Planning: Modeling USAF and Civilian Air Traffic Interactions in European Airspace	Edward Wigfield, Kelly Connolly, Alexander Alshtein, James DeArmon, Richard Flourney, William Hershey, John James, Paula Mahoney, Jennifer Mathieu, John Maurer and Paul Ostwald, The MITRE Corporation
A Free Transatlantic Aviation Market: Legal Regulatory Framework Concerning European Airspace System Needs to be Defined in Advance **(paper only)**	Mariagrazia Spada, University of Roma “La Sapienza”

Wednesday, May 3, 2006	
Session C3 – Integrated CNS Systems and Architectures Session Chair: Kenneth Arkind, Raytheon	
Required Total System Performance (RTSP)	Arek Shakarian, Boeing Phantom Works
IPv6 Based Aircraft Data Networks and Voice Services	Nagaraja Thanthry, Anuj Bhatia, Swapnil Shingvi and Ravi Pendse, Wichita State University
NGATS Dynamic Architecture	Ken Arkind, Raytheon Company
Flight Trial Architectures Supporting Migration to Broadband Internet Protocol (IP) for Airline Operations Communications (AOC) and Air Traffic Services (ATS) Communications	Robert Mead, Boeing, Phantom Works; Karl Griep, Dave Morse, Mark Taylor and Duane Harkness, Avaliant LLC
Communications, Navigation, Surveillance and Avionics within the 2020 Future Vision	Robert Morgenstern, The MITRE Corporation
The Use of Collaborative Rerouting Procedures Instead of Miles-in-Trail (MIT) Restrictions for Managing National Airspace System Choke Points	Paul Rigterink and Ed Ellenberger, Computer Sciences Corporation
Extended LAN Services and Aviation Data Networks	Nagaraja Thanthry, Sudha Kulkarni and Ravi Pendse, Wichita State University
Session C4 – CNS/ATM Simulation and Evaluation Session Chair: Chris Wargo, Computer, Networks & Software Inc.	
Communications, Navigation, and Surveillance Models in ACES - Design Implementation and Capabilities	Greg Kubat, Analex Corporation; Don Van Drei, NASA Glenn Research Center; Goutam Satapathy, Inteligent Automation, Inc.; Anil Kumar, CNS, Inc. and Manu Khanna, Comptel, Inc.
Communications, Navigation and Surveillance Models in ACES - Test Results and Sample Concept Simulation Results	Greg Kubat, Analex Corporation and Don Van Drei, NASA Glenn Research Center
NGATS CNS Test Bed	Rod Collins and Robin Finnegan, Sensis Corporation (presented by Ed Valovage)
A Trajectory-Based Probabilistic TFM Evaluation Tool and Experiment	Kris Ramamoorthy and George Hunter, Sensis Corporation
Day's Weather in the NAS	Alexander Klein, George Mason University
Identifying and Addressing Emerging Global Air Transport Issues and Risks - Improving the Future Air Transport Systems by Using Next Generation Innovative Modeling and Simulation Tools and Technologies	Chris Wargo, Computer Networks & Software, Inc.